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For: CALIBRATION SYSTEM FOR A COMMUNICATIONS SYSTEM

1 1. A calibration system for a communication system comprising
2 a transmitter circuit;
3 a receiver circuit;
4 a transmission medium having a transfer function for transmitting a
5 transmission signal between said transmitter and receiver circuits; and
6 a calibration circuit responsive to an altered reference signal of said
7 transmitter circuit altered by the transmission medium for adjusting the reference signal
8 level of one of said transmitter and receiver circuits to compensate for variations in the
9 transmission signal due to said transfer function.

1 2. The calibration system of claim 1 in which said calibration circuit adjusts
2 the reference signal level of both said transmitter and receiver circuits.

1 3. The calibration system of claim 1 in which said transmission medium
2 includes an isolation barrier circuit.

1 4. The calibration system of claim 3 in which said transmitter circuit includes a
2 digital to analog circuit having an analog output coupled to said isolation barrier circuit and
3 an input for receiving an digital input signal to be communicated across said isolation
4 barrier circuit and said receiver circuit includes an analog to digital circuit having an analog
5 input coupled to the isolation barrier circuit for receiving the analog signal communicated
6 across the isolation barrier and providing a digital output signal.

1 5. The calibration system of claim 4 in which said digital to analog circuit
2 includes a digital to analog converter with an input for receiving said digital input signal
3 and a modulation circuit responsive to said digital to analog converter for providing said
4 analog output.

1 6. The calibration system of claim 4 in which said digital to analog circuit
2 includes an encoder circuit responsive to said digital input signal to provide a digital signal,
3 and a digital to analog converter responsive to said digital signal to provide to said isolation
4 barrier said analog output.

1 7. The calibration system of claim 4 in which said calibration circuit adjusts
2 the reference signal level of both said transmitter and receiver circuits.

1 8. The calibration system of claim 4 in which said analog to digital circuit
2 includes an analog to digital converter responsive to said analog input from the isolation
3 barrier circuit to provide a digital signal, and a decoder circuit responsive to said digital
4 signal to provide said digital output signal.

1 9. The calibration system of claim 4 in which said analog to digital circuit
2 includes a demodulator circuit responsive to said analog input from the isolation barrier
3 circuit to provide an analog signal and an analog to digital converter responsive to said
4 analog signal to provide said digital output signal.

1 10. The calibration system of claim 1 where the communication system is a bi-
2 directional signal transfer system.

1 11. The calibration system of claim 10 in which said calibration circuit adjusts
2 the reference signal level of both said transmitter and receiver circuits.

1 12. The calibration system of claim 10 in which said said transmission medium
2 includes an isolation barrier circuit.

1 13. The calibration system of claim 12 in which said isolation barrier circuit
2 includes at least one isolation element; said transmission circuit includes a first digital to
3 analog circuit having an analog output coupled to a first side of the isolation barrier circuit
4 and an input for receiving a first digital input signal to be communicated across the isolation
5 barrier and a second digital to analog circuit having an analog output coupled to a second
6 side of the isolation barrier circuit and an input for receiving a second digital input signal to
7 be communicated across the isolation barrier circuit; and the receiver circuit including a first
8 analog to digital circuit coupled to the first side of the isolation barrier circuit for receiving
9 the analog output of the second digital to analog circuit and a second analog to digital
10 circuit coupled to the second side of the isolation barrier circuit for receiving the analog
11 output of the first digital to analog circuit.

1 14. The calibration system of claim 13 in which each of said first and second
2 digital to analog circuits include a digital to analog converter with an input for receiving
3 said digital input signal and a modulation circuit responsive to said digital to analog

4 converter for providing said analog output.

1 15. The calibration system of claim 13 in which each of said first and second
2 digital to analog circuits include an encoder circuit responsive to said digital input signal to
3 provide a digital signal, and a digital to analog converter responsive to said digital signal to
4 provide to said isolation barrier said analog output.

1 16. The calibration system of claim 13 in which each of said first and second
2 analog to digital circuits include an analog to digital converter responsive to said analog
3 input signal from the isolation barrier to provide a digital signal, and a decoder circuit
4 responsive to said digital signal to provide said digital output signal.

1 17. The calibration system of claim 13 in which each of said first and second
2 analog to digital circuits include a demodulator circuit responsive to said analog input signal
3 from the isolation barrier to provide an analog signal and an analog to digital converter
4 responsive to said analog signal to provide said digital output signal.

1 18. The calibration system of claim 13 wherein the communication system is a
2 simultaneous signal transfer system.

1 19. The calibration system of claim 18 further comprising a first echo
2 cancellation circuit, producing a first echo cancellation signal, coupled to the first analog to
3 digital circuit to remove the analog output of the first digital to analog circuit from the input

4 of the first analog to digital circuit, a first echo cancellation calibration circuit responsive to
5 the altered reference signal of the first digital to analog circuit to adjust said first echo
6 cancellation signal, a second echo cancellation circuit, producing a second echo cancellation
7 signal, coupled to the second analog to digital circuit to remove the analog output of the
8 second digital to analog circuit from the input of the second analog to digital circuit, and a
9 second echo cancellation calibration circuit responsive to the altered reference signal of the
10 second digital to analog circuit to adjust said second echo cancellation signal.

1 20. The calibration system of claim 19, wherein said first and second echo
2 cancellation signals are derived from the analog outputs of said first and second digital to
3 analog circuits, respectively.

4 21. The calibration system of claim 19, wherein the first echo cancellation signal
5 is separately generated based on the first digital input signal and the second echo
6 cancellation signal is separately generated based on the second digital input signal.

1 22. The calibration system of claim 21, in which each of said first and second
2 echo cancellation circuits includes a digital to analog circuit with an input connected to said
3 first and second digital input signals, respectively, and a voltage reference circuit, wherein
4 said first and second echo cancellation calibration circuits adjust the voltage reference
5 circuits based on the digital output signals of said first and second analog to digital circuits,
6 respectively.

1 23. The calibration system of claim 21, in which each of said first and second
2 echo cancellation circuits includes a digital to analog circuit with an input connected to said
3 first and second digital input signals, respectively, and a voltage reference circuit, wherein
4 said first and second echo cancellation calibration circuits adjust the voltage reference
5 circuits based on the altered reference signal of said first and second digital to analog
6 circuits, respectively.

1 24. The calibration system of claim 21 wherein the first echo cancellation circuit
2 includes a digital to analog converter with an input connected to the first digital input signal
3 and an output coupled to the input of the first analog to digital circuit and the second echo
4 cancellation circuit includes a digital to analog converter with an input connected to the
5 second digital input signal and an output coupled to the input of the second analog to digital
6 circuit.

1 25. The calibration system of claim 1 including a control circuit coupled to the
2 transmission medium to synchronize the adjustment of the reference signal level.

1 26. The calibration system of claim 25 in which the control circuit includes a
2 clock circuit.

1 27. The calibration system of claim 26 in which the control circuit includes a
2 control channel.

1 28. The calibration system of claim 2 including a control circuit coupled to the

2 transmission medium to synchronize the adjustment of the reference signal levels.

1 29. The calibration system of claim 28 in which the control circuit includes a
2 clock circuit.

1 30. The calibration system of claim 29 in which the control circuit includes a
2 control channel.

1 31. The calibration system of claim 4 in which the analog output is a constant
2 average signal.

1 32. The calibration system of claim 4 in which the analog input is a constant
2 average signal.

1 33. The calibration system of claim 4 wherein said calibration circuit includes a
2 reference signal capture circuit for capturing an altered reference signal and providing said
3 altered reference signal to said receiver circuit, wherein said altered reference signal
4 compensates for variations in the transmission signal due to said transfer function.

1 34. The calibration system of claim 33 wherein said calibration circuit includes
2 a reference signal averaging circuit connected to said reference signal capture circuit for
3 averaging said altered reference signal and providing an averaged altered reference signal to
4 said receiver circuit.

1 35. The calibration system of claim 13 wherein said calibration circuit includes
2 first and second calibration circuits, each of said first and second calibration circuits
3 including a reference signal capture circuit for capturing an altered reference signal and
4 providing said altered reference signals to said first and second receiver circuits
5 respectively, wherein said altered reference signals compensate for variations in the
6 transmission signals due to said transfer function.

1 36. The calibration system of claim 35 wherein each of said first and second
2 calibration circuits include a reference signal averaging circuit connected to said reference
3 signal capture circuit for averaging said altered reference signal and providing an averaged
4 altered reference signal to said first and second receiver circuits, respectively.

1 37. The calibration system of claim 19 including a control circuit coupled to the
2 transmission medium to synchronize the adjustment of the reference signal levels and the
3 echo cancellation signals.

1 38. The calibration system of claim 37 in which the control circuit includes a
2 clock circuit.

1 39. The calibration system of claim 38 in which the control circuit includes a
2 channel control.